Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz	)	GN Docket No. 17-183

COMMENTS OF APPLE INC., BROADCOM INC., COMMSCOPE INC., FACEBOOK, INC., GOOGLE LLC, HEWLETT PACKARD ENTERPRISE, INTEL CORPORATION, MICROSOFT CORPORATION, AND QUALCOMM INCORPORATED

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INTRODUCTION AND SUMMARY

The Commission's bipartisan *6 GHz Order*[1] laid the foundation for the future of Wi-Fi and other unlicensed technologies. It more than doubled the frequencies available for unlicensed devices, bolstering home and business connectivity at exactly the moment that the country has needed it most. The January 11, 2021 *Public Notice* would allow the Commission to build on this success by permitting "direct communications between client devices" using 6 GHz spectrum.[2] This action will provide innovators greater technical flexibility, support better service for consumers and enterprises, and not cause harmful interference to incumbent operations.

Client-to-client ("C2C") communications—*i.e.*, communications between 6 GHz client devices without routing signals through an intervening access point ("AP")—will support a range of innovative use cases, and numerous parties have supported their authorization.[3] As described below, the Commission can ensure that consumers realize the benefits of those use cases without undermining the robust protections for licensees that the Commission put in place in the *6 GHz Order*. It can achieve that goal by permitting direct communications between client devices in

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1 *Unlicensed Use of the 6 GHz Band, Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852 (2020) ("*6 GHz Order*").

2 Public Notice, *The Office of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communications in the 6 GHz Band*, DA 21-7, ET Docket No. 18-295, GN Docket No. 17-183, at 1 (rel. Jan. 11, 2021) ("*Public Notice*").

3 *See*, *e.g.*, Letter from Paul Caritj, Counsel for Apple Inc., Broadcom Inc., Facebook, Inc., Google LLC, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183, at 1-2 & attach. slides 9-10 (filed Nov. 6, 2020); Reply Comments of Broadcom Inc. and Microsoft Corporation at 2-4, ET Docket No. 18-295, GN Docket No. 17-183 (filed July 27, 2020); Comments of Apple Inc., Broadcom Inc., Google LLC, and Microsoft Corporation at 11-14, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 29, 2020); Comments of the Dynamic Spectrum Alliance at 19-20, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 29, 2020).

cases where each client can decode an enabling signal received from any low-power indoor ("LPI") AP at -99 dBm/MHz or a stronger signal level. The rules should permit a client device to transmit to another client device if and only if it has decoded an enabling signal from an LPI AP, on any 6 GHz channel, within the last four seconds. Client devices that are in communications with one another could receive enabling signals from the same, or different, LPI APs. In either scenario, the Commission should permit operation at the same power levels it adopted for client devices associated with LPI APs in the *6 GHz Order*.

I. CONSUMERS AND ENTERPRISES NEED C2C COMMUNICATIONS TO SUPPORT A RANGE OF IMPORTANT USE CASES.

The Commission authorized LPI operations in order to "create new unlicensed use opportunities in these bands . . . while protecting the various incumbent licensed services in the band."[4] The existing rules require client devices to route all communications through an intervening AP, even when such routing is unnecessary, not desired by the user, and not required to protect incumbents. This needless routing creates real costs by: (1) wasting spectral resources, which contributes to congestion; (2) creating unnecessary latency and reducing communication-link reliability, both of which undermine or eliminate important use cases that require extremely high throughput and low latencies at short ranges; and (3) causing avoidable energy expenditures, which depletes batteries faster and increases environmental footprints. Direct C2C operation avoids these costs and offers significant advantages in situations where an intervening AP is not necessary or practical. Authorizing C2C communications thus furthers the Commission's objectives for the 6 GHz band.

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[4] *6 GHz Order* ¶ 98.

The *Public Notice* asks for information on "the types of applications that direct client-to-client communications would enable that cannot be accomplished by communications through an access point."[5] APs serve many important network management functions for a range of common applications and will remain core to the 6 GHz band. But C2C communications would offer important additional flexibility for network topologies and low-latency applications. C2C communications will reduce congestion and improve spectral efficiency by offloading bandwidth-intensive data exchanges between clients onto a separate channel and allowing some communications to occur with fewer total transmissions (*i.e.*, lower duty cycle and airtime), lower latency due to the omission of the path through the AP, at lower power levels than an AP-centric transmission, and at a higher bitrate. C2C communications also will allow interactions between clients in situations, topologies, and use cases where it is impractical or unnecessary to gain access to an infrastructure-based network.

Reducing congestion and improving spectral efficiency. C2C communications would facilitate superior spectrum management by allowing high-bandwidth transfers to be offloaded from the channel used by the AP itself. This would reduce congestion by spreading traffic over a wider range of frequencies. In addition, C2C communications reduce average transmit power levels in 6 GHz frequencies by replacing transmissions at the power levels used by LPI APs with client transmissions at lower power. These transmissions can be more efficient still due to the often-shorter distance between client devices, which can facilitate transmissions at higher data rates and/or lower power levels, further optimizing the spectral environment. The C2C topology also avoids the expenditure of energy for superfluous transmissions to the AP—*i.e.*, only one C2C transmission is needed, whereas current 6 GHz band rules would require *at least* one more

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[5] *Public Notice* at 2.

node in a transmission involving an AP, and potentially two more nodes if the devices are associated with different APs in a mesh configuration, as illustrated in the figures below.

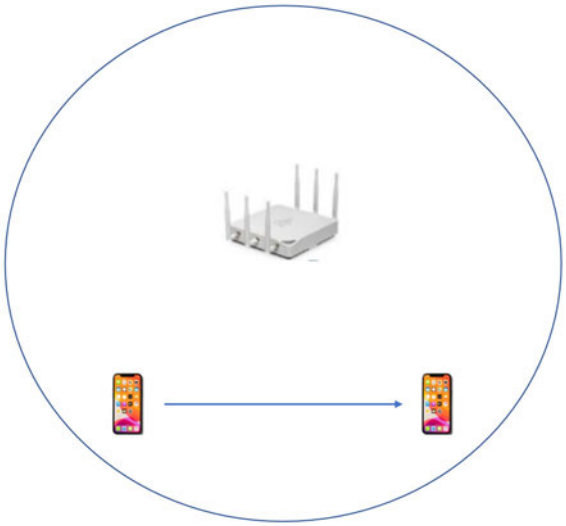

Figure 1a – Direct C2C Communication, Single Transmission

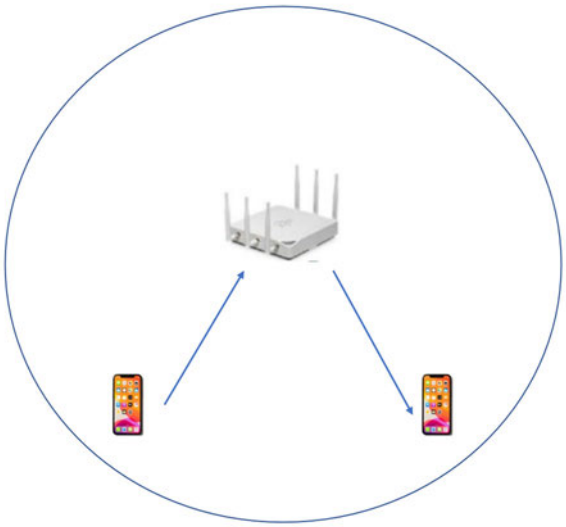

Figure 1b – Regular Client-AP Relationship Requires Two Transmissions for Same Communication

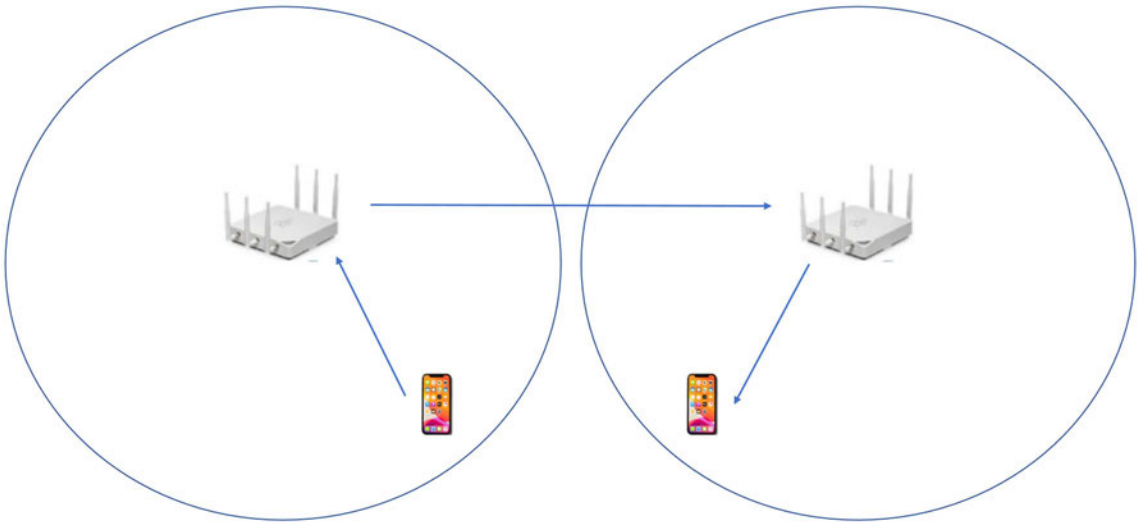

Figure 1c – Regular Client-AP Relationship, via Two APs, Requires Three Transmissions for Same Communication

Supporting additional use cases and user environments. C2C operation also enables uses of the 6 GHz band that could not otherwise occur. There are many situations in which client devices can engage in desired and useful communications directly with other client devices inside a location while associating with only some or none of the location's APs—this is true both in public locations and in residential settings.

Public locations. C2C will produce substantial user and network-management benefits by supplementing LPI and other AP-mediated communication in public environments such as airport terminals, healthcare facilities, large individual school or office buildings, conference centers, and government buildings. These locations will be equipped with LPI APs and densely populated both by visitors carrying one or more portable 6 GHz devices, and by employees with authorization to associate with some but not all local APs. While AP-mediated communications will remain of central importance, in some situations there will be no need for individual client devices to associate with local LPI APs. People will want to communicate directly with other people's client devices in these communal areas to exchange files between devices, screen share,

or otherwise interact—at the high bandwidths and low latencies that only the 6 GHz band offers. Without C2C communications, they would be unable to do so in situations where they have not associated or may not associate with the same AP. Furthermore, as discussed above, in these situations a person can communicate far more efficiently through a single C2C transmission at potentially lower power compared to multiple communications routed through APs. That is particularly the case because many such data-intensive transfers could occur simultaneously among people communicating in an airport terminal, school building, conference center, office, or government facility. The more efficient use of 6 GHz spectrum enabled by C2C communications in situations where AP-mediated communication is not necessary benefits all users in the facility by reducing the number of transmissions, and thereby increasing spectral and energy efficiency.

Residential settings. C2C communication would also produce important benefits in consumers' homes or other residential situations beyond the public environments described above. For example, C2C transmissions will facilitate:

- Device-to-device communications between gaming controllers or AR/VR gaming devices in which headsets share the screen of one player with another or share information about positioning or movement of the controller or headset;
- Onboarding new devices such as speakers, smoke detectors, thermostats, and smart home hubs that are not yet connected to a consumer's AP;
- Streaming 4K video directly between handsets and tablets or to smart TVs; and
- The direct exchange of security keys between devices for password-sharing features or other applications designed to improve device security.

As in the examples from public areas, in these home-use scenarios, there is often no need to mediate communications through an LPI AP for the routing and delivery of messages where

the devices are in range of one another, so C2C operation will improve spectral and energy efficiency.

II. THE COMMISSION SHOULD PERMIT CLIENT-TO-CLIENT COMMUNICATIONS AT THE SAME POWER LEVEL AS CLIENT DEVICES ASSOCIATED WITH LPI APS, RATHER THAN CREATE A NEW DEVICE CLASS.

The Commission's technical rules should make C2C operations feasible and effective. In particular, C2C communications should operate under and within an LPI client authorization at up to -1 dBm/MHz power spectral density.[6] The Commission analyzed the technical record carefully and extensively in the *6 GHz Order* to conclude that the 5 dBm/MHz authorized power limit for APs would not create a significant risk of harmful interference and that the 6 dB lower PSD and maximum power for client devices would "provide protection to incumbents as client devices operate in the vicinity of access points."[7] In a C2C scenario with the -99 dBm/MHz enabling-signal restriction, client devices will be in exactly the same or closer indoor locations and at exactly the same maximum power levels of already-approved LPI client devices. In fact, this situation will be *more* protective for incumbents because an unnecessary transmission to and from the higher power AP has been removed. The transmission therefore can likely occur at a higher order modulation to reduce the amount of time the client device is on the air. It is therefore unnecessary and arbitrary to establish a lower power level for two client devices

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6 *See Public Notice* at 2-3.

7 *6 GHz Order* ¶ 111; *see also id.* ¶ 103 ("to ensure that client devices remain in close proximity to the indoor access points, we are limiting their PSD and maximum transmit power to 6 dB below the power permitted for the access points"), ¶¶ 112-40 (discussing Commission's review of technical record), ¶ 199 ("When a client device is under the control of a low-power indoor access point, it should also be indoors and in close proximity to the access point, and therefore avoid presenting an interference risk to licensed services."), ¶ 202 ("our rules are designed to prevent the low-power access points from being used outdoors which should also keep the client devices indoors").

communicating with each other directly compared to the same devices communicating with each other through an AP.

Establishing a C2C power level lower than the LPI client power level would undermine international harmonization and deny consumers the lower prices and other benefits of equipment economies of scale. Our companies are advocating for C2C globally. Regulators in South Korea and the European Union are among those who have made the most progress on 6 GHz rules characterized by pro-innovation flexibility. We expect these countries to also allow clients to operate in a C2C situation at the same power level as clients in an LPI network. If the FCC were to set a lower power limit for C2C communications in the United States than is authorized for other LPI operations, it would effectively create a new device class that may not exist anywhere else in the world. This would also make certification of this *sui generis* device class more expensive and less efficient, all without technical justification.

Lower power limits than are necessary to protect against harmful interference would also significantly reduce the utility of use cases for C2C transmissions through diminished range and lower throughput. It could also confuse users by degrading C2C transmissions in locations even where devices can receive a strong signal from an AP. Retaining the existing LPI client power limit for devices operating in C2C mode, on the other hand, will make C2C range and capabilities similar to client-to-AP coverage, in turn making these applications easier for consumers to understand and use.

The Commission is also considering authorizing portable VLP devices to operate indoors and outdoors. Permitting VLP operation is important because VLP devices can operate in many more locations than C2C, in situations where there is no proximate LPI AP.[8] At the same time,

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[8] *See id.* ¶¶ 233-43.

C2C is important because, with higher power levels than VLP, it would support indoor immersive experiences and other applications that require extremely low latencies. The two device classes are complements, not substitutes for one another, supporting unique use cases in different locations. For this reason, it is important to allow both C2C communications at the LPI client power levels and VLP operation at 14 dBm.

III. THE COMMISSION SHOULD PERMIT CLIENT-TO-CLIENT COMMUNICATIONS BETWEEN ANY CLIENTS THAT CAN DECODE AN ENABLING SIGNAL TRANSMITTED BY AN LPI ACCESS POINT WITHIN THE LAST FOUR SECONDS.

In the *6 GHz Order*, the Commission limited LPI client devices to operate "under the control" of an LPI AP "to prevent client devices from causing harmful interference by limiting their operation . . . to indoor locations where [factors] such as building entry loss prevent harmful interference."[9] But the *Public Notice* recognizes that the "Commission did not, however, examine whether a more limited approach to indoor [C2C] communications within the ambit of the *6 GHz Notice*" would similarly protect against harmful interference, and therefore seeks comment on this matter.[10]

The Commission can authorize direct C2C operations without the control of an LPI AP consistent with the rationale underlying the decisions in the *6 GHz Order*. Frequent receipt of an enabling signal, as discussed below, provides even more protection than what the Commission already concluded was sufficient for LPI APs and client devices associated with them.

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[9] *Public Notice* at 3; *see 6 GHz Order* ¶ 199.

[10] *Public Notice* at 2.

A. The Commission Should Define Enabling Signal in a Technology-Neutral Manner.

The purpose of an "enabling signal" in the context of C2C communications is not to associate a device with a particular AP.[11] Rather, an enabling signal for C2C purposes serves to establish the proximity of the client device to an LPI AP—namely, the same proximity (or even closer proximity, due to the -99 dBm/MHz restriction) that would be needed if the device were going to associate with the AP as a regular client. This proximity provides an equivalent or greater level of protection against harmful interference as association with an AP, without the limitations of association.

For example, one anticipated C2C communication scenario would be to share a short video clip between users. In this case, the primary purpose of the AP enabling signal is for a client device to determine that it is operating close to an AP, not to associate with the AP. In some instances, the client device may not be able to associate with an AP because it is using a secure network that is not providing network access to that device (*e.g.*, any network that has closed access, such as a secure facility, corporate location, or a residence a person is visiting). Furthermore, some devices, such as gaming accessories (*e.g.*, a headset or controller) connecting to a battery-operated device, may not have a user interface capable of connecting to a network.

In other instances, even though the device is capable of onboarding to a network, it could be cumbersome for the user to associate with an AP, especially when the user has no need to connect to that network. For example, a traveler could share a video with a companion at an airport just before they board separate planes. Needing to authenticate to the airport AP, and

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[11] *See id.* at 2 (seeking comment on the "characteristics" an enabling signal must have and "the degree to which an enabling signal would tether a client device not under the direct control of an access point to that access point").

only then transfer the file, creates unnecessary friction in the user experience. Moreover, many public guest Wi-Fi networks currently block peer-to-peer communication even for devices both connected to the same AP. As discussed above, many important C2C use cases have no need for association with an LPI AP, and latency, spectrum management, and power efficiency gains accrue from elimination of unnecessary communications involving the AP.

In this regulatory context, the Commission should reflect those objectives by defining "enabling signal" in a functional and technology-neutral way that ensures proximity to an LPI AP but does not limit innovation by various standards bodies. From a Wi-Fi perspective, an 802.11 beacon frame is one current message that could operate as an enabling signal, but other messages developed by Wi-Fi Alliance or other organizations may also be defined. The Commission should not run the risk of locking out other or future technologies through adoption of a narrow definition that could require time-consuming revisions to the rules to simply accommodate new innovation. Instead, the Commission should define an enabling signal as an encoded signal transmitted by an AP that carries information sufficient to establish that a client device decoding it is within the operating range of that AP.

A definition of enabling signal that requires association with the AP would arbitrarily and unnecessarily require a particular type of stateful network connection, undermining the technological neutrality of the 6 GHz rules without any corresponding benefit. There is nothing inherent to "association" with an AP that reduces the risk that an LPI client device will operate outside—and the Commission can gain the same (if not greater) certainty regarding indoor operation of those devices by requiring the decoding of a simple enabling signal.

B. The Commission Should Ensure Proximity to an LPI AP by Requiring that Devices in C2C Mode Can Decode an Enabling Signal of at Least -99 dBm/MHz Once Every Four Seconds.

The *Public Notice* raises the possibility that a device may "receive an enabling signal from an [AP] even when the enabling signal is too weak to enable the client device to conduct communications with the [AP]," making it "more likely that the client device could be outdoors."[12] The Commission can address that concern by requiring that devices in C2C mode decode an enabling signal of at least -99 dBm/MHz once every four seconds.

The -99 dBm/MHz threshold provides sufficient power to ensure that the device is constrained to the AP coverage area. The -99 dBm/MHz threshold is strong enough to ensure a stable connection even in a real-world channel with strong multipath (frequency selective) fading. In fact, devices are able to associate and communicate with APs at even lower power. From a practical perspective, we anticipate that devices would operate in C2C mode only in areas that are even closer to the AP, so that inevitable RSSI fluctuations caused by multipath, antenna orientation, body loss, and other factors do not cause the client device to decode the enabling signal below the -99 dBm/MHz threshold, suspending C2C operations and disrupting the user experience.

Thus, a requirement that C2C devices decode an enabling signal at -99 dBm/MHz is even more constraining than the already-safe requirement that a device be associated with the AP. Under this proposal, there is no increased risk of harmful interference from two devices communicating from locations that are closer than, or in the worst case equal to, regular client distances from the AP. Likewise, it prevents any potential for "daisy chaining" devices together, wherein one device could operate where it would not otherwise be permitted by communicating

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[12] *Id.* at 3.

with another client device rather than an AP. Each device operating in C2C mode would need to successfully decode an enabling signal from an LPI AP at the constrained power level—and to maintain that decoding at least every four seconds—for the duration of any C2C communications. Neither client device would operate in any location where it could not have operated through association with an LPI AP.

Requiring each device in C2C mode to decode an enabling signal at the -99 dBm/MHz power level every four seconds further reduces the potential for harmful interference by ensuring the client device remains in proximity to LPI APs. At average walking speed, the four-second recheck interval would only allow a user to move a very short distance before loss of the enabling signal would require a device to cease C2C transmissions, in the worst case. It is very unlikely that in that brief recheck interval a device will have moved from inside a building to outside, without a sudden and substantial decrease in the received enabling-signal power level to below -99 dBm/MHz due to building loss. The probability that this would occur in a way that creates a material risk of harmful interference is far lower still. Indeed, manufacturers will have a strong incentive to prevent devices from moving outdoors while in C2C mode, as the sudden breaks in connectivity would be harmful to the user experience. They may, for example, warn users in advance that they are close to moving out of range of the AP based on the received power level of enabling signals.

A requirement to decode enabling signals more frequently than once every four seconds would also be very burdensome. Because C2C communications will commonly occur on a different channel than client-to-AP communications, these devices will often need to change channels back to the primary channel used by the AP in order to detect the enabling signals that the AP transmits. If a device spends too long a period on the AP channel waiting for an enabling

signal, however, the user experience could be disrupted. Therefore, in every four-second interval, a device will likely spend a number of very short intervals off-channel, listening for an AP enabling signal, to maximize the odds of detecting an enabling signal with the minimum possible effect on the throughput or latency of the C2C transmission. Likewise, APs, which likely will include an enabling signal in their control signaling, will be designed to transmit this signal much more frequently than once every four seconds in order to maximize the probability that devices will detect an enabling signal during one of the brief periods when they are listening for one. Thus, an even shorter detection interval will require devices to spend more time off channel in order to ensure that they detect and decode the enabling signal in the time required. A four-second recheck requirement provides requisite protection against outdoor operation, while still making possible efficient use of available spectrum.

IV. THE COMMISSION SHOULD NOT LIMIT CLIENTS TO DECODING AN ENABLING SIGNAL FROM THE SAME ACCESS POINT IN ORDER TO COMMUNICATE DIRECTLY.

The *Public Notice* asks whether it is necessary to limit "client devices . . . to receiving an enabling signal from the same" AP or whether it is sufficient that "each client device receives an enabling signal from any authorized" AP.[13] A requirement that devices must decode enabling signals from the same LPI AP to engage in C2C communications would introduce needless complexity and undermine user experience, without any material increase in protection against harmful interference.

First, a "same AP" requirement would make engaging in C2C communications unnecessarily complex, because devices would need to engage in new control signaling to determine which AP enabled each device before allowing C2C mode. The IEEE 802.11 control

[13] *Id.*

signaling design in 6 GHz is intended to minimize airtime overhead. A requirement for frequent control signaling would be contrary to the goal of greater spectral efficiency, or would require the devices to frequently go off channel to send control signals in another band, which would jeopardize the anticipated use cases by increasing the latency of the 6 GHz transmission. The unnecessary check—presumably on some periodic basis—also would increase congestion and decrease device performance in the same manner that needlessly frequent enabling-signal rechecks would.

Second, a "same AP" restriction would also significantly undermine the usability of C2C services. It would result in situations where users attempt to communicate with one another within the same building (*e.g.*, an airport corridor while two travelers are walking, or an office environment where colleagues are several cubicles apart) but are unable to do so because each device, unknown to the user, is decoding an enabling signal from a different indoor AP within the same building. Users would have no way to predict when this would occur, because users in such environments typically do not know which AP is closest at a given time, and the client devices may be able to decode an enabling signal from several APs at one time on different channels. This would be a major problem in large institutional settings such as offices, hospitals, and schools—but it would also be a problem in many home environments, where multiple-AP configurations are increasingly common.

Third, a "same AP" requirement would offer no material increase in protection against harmful interference. Devices operating in C2C mode based on each device's successful decoding of an enabling signal from a different LPI AP do not present a different potential for harmful interference than do the same two devices communicating as already-approved LPI clients with the APs with which they could be associated, as the 6 GHz rules already permit. The

protection against harmful interference from two or more devices engaged in C2C communications is attributable to their individual proximity to an LPI AP (*i.e.*, their ability to decode an enabling signal from an LPI AP), not to their common relationship with the same AP or any other mutual relationship.

The *Public Notice* asks whether permitting devices to engage in C2C communications when decoding enabling signals from different APs might "increase the potential for the client devices to cause harmful interference to licensed services," such as if "client devices in two different buildings receiving enabling signals from different low-power [APs] . . . attempt to communicate with each other."[14] That hypothetical is unlikely to occur. Both devices would almost certainly be indoors, given the Commission's LPI rules.[15] Thus, for the two devices to attempt to communicate with one another, their signals would need to penetrate the exterior walls of their own building and the second building, which is extraordinarily unlikely, as supported by the modeling of building entry loss the Commission relied on in the *6 GHz Order*.[16] And the devices would not attempt to communicate with one another at any higher power than each is already permitted to use with its respective AP, making this situation identical to an ordinary LPI client-to-AP interaction, which the Commission has concluded will not cause harmful interference. Furthermore, this scenario is unlikely to occur because clients will need to communicate with other clients at much closer range than when communicating with APs. This is because APs transmit at a higher power and typically have more antennas with better receive sensitivity than clients. In addition, it is hard to imagine common circumstances where two

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[14] *Id.*

[15] *See 6 GHz Order* ¶¶ 199, 202.

[16] *See id.* ¶ 218 ("an appropriate assumption for building loss is 20.5 dB").

people would want to engage in C2C communications while inside different structures. C2C empowers many use cases for two people in the same room—transferring high-resolution images or video, gaming together, or other similar interactive uses—but it is unlikely to offer advantages to occupants of two separate buildings.

V. THE COMMISSION SHOULD NOT REQUIRE THAT CLIENT DEVICES DECODE ENABLING SIGNALS ON THE SAME CHANNEL.

Finally, the *Public Notice* asks whether the "enabling signal [must] be received on the same channel for each device."[17] This requirement is unnecessary for devices decoding enabling signals from LPI APs. Successful decoding of an enabling signal from an LPI AP on any channel should entitle a device to engage in C2C communications on any available 6 GHz channel.

The successful decoding of an enabling signal from an LPI AP on any channel achieves the Commission's objectives regarding harmful interference to incumbents—*i.e.*, it provides the requisite assurance that the device is operating in proximity to an LPI AP. There is no added benefit from limiting C2C communications to the channel of the enabling signal. Because an LPI AP can operate on any channel, incumbents will likewise be protected from devices on any channel, so long as those devices only operate near the AP. Just as the AP's actual channel of operation is not significant for the purposes of preventing harmful interference, the authorization to transmit based on the decoding of an enabling signal should not be channel-specific either.

Moreover, it is important for the utility of the use case to permit devices to decode enabling signals on a different channel from the one on which they engage in C2C communications. Shifting the C2C traffic to a different channel from the channel in which the

[17] *Public Notice* at 3.

AP is operating avoids disruption between the two types of traffic. That is particularly important for managed networks, as it simplifies the logic of scheduling high-volume traffic to use one channel at any given point in time for enabling-signal traffic, rather than constantly juggling enabling-signal traffic in all available channels so that devices can make use of them.

Conversely, a requirement to engage in C2C communications only in the channel of a decoded enabling signal would unnecessarily add traffic to the infrastructure's channel, thereby potentially disrupting communications of associated client devices on that network. It may also eliminate use cases where multiple people may want to engage in C2C communications in the same location.

CONCLUSION

Extending the Commission's current rules for clients associated with LPI APs by enabling direct communications between devices will enable important and valuable use cases for consumers. The Commission can achieve that while still protecting incumbents in the same manner as it did in the *6 GHz Order* by authorizing those direct communications when both devices are within the same range of an LPI AP as the range needed to associate with that AP. Decoding an enabling signal from an LPI AP every four seconds that is received by the device at -99 dBm/MHz ensures that the devices are near an AP (and thus indoors). Devices satisfying that condition should be permitted to engage in C2C communications with any other device that has done the same, on any channel.

Respectfully submitted,

Apple Inc.
Broadcom Inc.
CommScope Inc.
Facebook, Inc.
Google LLC
Hewlett Packard Enterprise
Intel Corporation
Microsoft Corporation
Qualcomm Incorporated

February 22, 2021